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HARNES, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303			GARCIA JR, RENE	
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			2853	

DATE MAILED: 02/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/806,030

Applicant(s)

HIGUCHI ET AL.

Examiner

Rene Garcia, Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-42 and 47-51 is/are rejected.
- 7) ☒ Claim(s) 43-46 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/14/04; 3/22/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The information disclosure statement filed 14 October 2004 cites reference 2002-089502 Simons et al. (7/11/2002), however document has not been provided by applicant and is not located in the USPTO database, therefore has not been considered.

### ***Specification***

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The abstract of the disclosure is objected to because of undue length. Correction is required. See MPEP § 608.01(b).
4. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Droplet Ejection Apparatus Including Recovery Processing With A Standby Power Supply.

### ***Claim Objections***

5. Claim 39 recites the limitation "the ejection failure detecting means" in line 2. There is insufficient antecedent basis for this limitation in the claim.

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6. Claim 40 recites the limitation "the ejection failure detecting means" in line 2. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 18, 48 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0170353) in view of Fujii (US 6,299,277).

**Usui et al. disclose the following claimed limitations:**

\*regarding claim 1, residual vibration detecting means for detecting a residual vibration of the diaphragm/**vibrating plate, 176/** displaced by the driving of the actuator/**106/** (figs. 20A, 20B, 20C, 21C & 21E; paragraph 0107 and 0169)

\*storage means/**memory device, 7/** for storing a vibration pattern of the residual vibration of the diaphragm/**176/** detected by the residual vibration detecting means and/or information obtained from the vibration pattern (figs. 43A, 43B, 43C; paragraph 0282 and 0284)

\*wherein the droplet ejection apparatus/**ink jet printer/** is constructed so that, when the cutoff of the main power supply/**41/** is detected by the power cutoff detecting means, the actuator/**106/** is driven by the driving circuit/**transmission circuit/** (paragraph 0176), the residual vibration detecting means detects the residual vibration of the diaphragm/**176/** displaced by the driving of the actuator/**106/**, and the storage means/**7/** stores the vibration pattern of the residual

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vibration of the diaphragm/176/ detected by the residual vibration detecting means and/or the information obtained from the vibration pattern

\*Regarding claim 1, preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

\*regarding claim 2, residual vibration of the diaphragm/176/ detected by the residual vibration detecting means is a residual vibration of the diaphragm/176/ when the actuator/106/ is driven by the driving circuit/transmission circuit/ to such an extent that a droplet/liquid/ (paragraph 0003) is not ejected (paragraph 0027; liquid held in cavity/not ejected/)

\*regarding claim 18, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration (paragraph 0284 – “resonant frequency”)

\*regarding claim 48, actuator includes a piezoelectric actuator having a piezoelectric element and using a piezoelectric effect of the piezoelectric element (paragraph 0009; paragraph 0161)

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\*regarding claim 51, droplet ejection apparatus includes an ink jet printer (paragraph 0003)

**Usui et al. does not disclose the following:**

- \*regarding claim 1, main power supply for supplying a power to the apparatus
- \*power cutoff detecting means for detecting cutoff of the main power supply
- \*standby power supply which supplies a power to the apparatus when the power cutoff detecting means detects the cutoff of the main power supply

**Fujii discloses the following:**

\*regarding claim 1, main power supply/41/ for supplying a power to the apparatus/ink jet printer, 1/

\*power cutoff detecting means (col. 8, lines 24-31) for detecting cutoff of the main power supply/41/

\*standby power supply/battery power supply, 42/ which supplies a power to the apparatus/1/ when the power cutoff detecting means detects the cutoff of the main power supply/41/ (col. 8, lines 24-31; figs. 2 and 3) for the purpose of saving various kinds of data and information on various flags in a save battery area within RAM.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a main power supply for supplying a power to the apparatus, power cutoff detecting means for detecting cutoff of the main power supply, standby power supply which supplies a power to the apparatus when the power cutoff detecting means detects the cutoff of the main power supply as taught by Fujii into Usui et al. for the purpose of saving various kinds of data and information on various flags in a save battery area within RAM.

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9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0170353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Kawamura (US 4,577,203).

**Usui et al. as modified by Fujii disclose all the claimed limitations except for the following:**

\*regarding claim 3, head position detecting means for detecting whether or not the droplet ejection heads are located at a home position

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means under the condition where the head position detecting means detects that the droplet ejection heads are not located at the home position, the droplet ejection heads are moved to the home position

**Kawamura discloses the following:**

\*regarding claim 3, head position/1/ detecting means for detecting whether or not the droplet ejection heads/1/ are located at a home position (col. 16, line 48 – col. 17, line 27)

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means under the condition where the head position detecting means detects that the droplet ejection heads are not located at the home position, the droplet ejection heads are moved to the home position (fig. 13A; col. 16, line 48 – col. 17, line 36) for the purpose of not allowing the print head to dry out/become clogged

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a head position detecting means for detecting whether or not the droplet ejection heads are located at a home position, wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means under the condition where the

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head position detecting means detects that the droplet ejection heads are not located at the home position, the droplet ejection heads are moved to the home position as taught by Kawamura into Usui et al. as modified by Fujii for the purpose of not allowing the print head to dry out/become clogged.

10. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) and Kawamura (US 4,577,203) as applied to claims 1 and 3 above, and further in view of Otsuka et al. (US 2002/0039120).

**Usui et al. as modified by Fujii and Kawamura disclose all the claimed limitations except for the following:**

\*regarding claim 4 and 6, protection means for protecting at least a nozzle surface of the droplet ejection heads

\*protection state detecting means for detecting whether or not the droplet ejection heads are in the protection state by the protection means

\*regarding claim 5, protection means protects the droplet ejection heads in the case where the droplet ejection heads are not in the protection state by the protection means when the cutoff of the main power supply is detected by the power cutoff detecting means

**Otsuka et al. disclose the following:**

\*regarding claim 4 and 6, protection means/**cap unit, 140/** for protecting at least a nozzle surface/**discharge port/** of the droplet ejection heads/**recording head cartridge, H100/** (paragraph 0139) for the purpose of preventing the ink from thickening

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\*protection state/**recording operation at rest**/ detecting means for detecting whether or not the droplet ejection heads are in the protection state by the protection means (see claim 3; home position means is protection means) for the purpose of preventing the ink from thickening

\*regarding claim 5, protection means protects the droplet ejection heads in the case where the droplet ejection heads are not in the protection state by the protection means when the cutoff of the main power supply is detected by the power cutoff detecting means (see claim 3) for the purpose of preventing the ink from thickening

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a protection means for protecting at least a nozzle surface of the droplet ejection heads, protection state detecting means for detecting whether or not the droplet ejection heads are in the protection state by the protection means, protection means protects the droplet ejection heads in the case where the droplet ejection heads are not in the protection state by the protection means when the cutoff of the main power supply is detected by the power cutoff detecting means as taught by Otsuka et al. into Usui et al. as modified by Fujii and Kawamura for the purpose of for the purpose of preventing the ink from thickening.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203) and Otsuka et al. (US 2002/0039120) as applied to claim 4 above, and further in view of Takahashi et al. (US 5,475,404)

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**Usui et al. as modified by Fujii, Kawamura and Otsuka et al. disclose all the claimed limitations except for the following:**

\*regarding claim 7, storage means stores the detection result by the protection state detecting means.

**Takahashi et al. disclose the following:**

\*regarding claim 7, storage means/**memory, 131/** stores the detection result by the protection state detecting means (capping; figs. 9 and 10; col. 11, lines 25-45) for the purpose of determining proper recovery means, idle discharge or idle discharge with ink absorbing.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a storage means stores the detection result by the protection state detecting means. as taught by Takahashi et al. into Usui et al. as modified by Fujii, Kawamura and Otsuka for the purpose of determining proper recovery means, idle discharge or idle discharge with ink absorbing.

12. Claims 8, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Usui (US 6,820,955).

**Usui et al. as modified by Fujii disclose all the claimed limitations except for the following:**

\*regarding claim 8, time measuring means for measuring a time period from the time when the cutoff of the main power supply is detected by the power cutoff detecting means to the time when the main power supply is switched on

\*regarding claims 10 and 12, recovery means for carrying out recovery processing for the droplet ejection heads to eliminate an ejection failure

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads to eliminate the ejection failure on the basis of the vibration pattern of the residual vibration of the diaphragm and/or the information obtained from the vibration pattern which are stored in the storage means

**Usui disclose the following:**

\*regarding claim 8, time measuring means for measuring a time period from the time when the cutoff of the main power supply is detected by the power cutoff detecting means to the time when the main power supply is switched on (fig. 10; col. 22, lines 38-59) for the purpose of determining if any print head maintenance is necessary

\*regarding claims 10 and 12, recovery means for carrying out recovery processing for the droplet ejection heads to eliminate an ejection failure (figs. 5 and 10; col. 22, line 60- col. 23, line 53; obtains temperature information and with respect to downtime adjust driving signal – prepares for printing commands) for the purpose of maintaining a quality print image

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads to eliminate the ejection failure on the basis of the vibration pattern of the residual vibration of the diaphragm and/or the information obtained from the vibration pattern which are stored in the storage means for the purpose of maintaining a quality print image

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a time measuring means for measuring a time period from the

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time when the cutoff of the main power supply is detected by the power cutoff detecting means to the time when the main power supply is switched on; and recovery means for carrying out recovery processing for the droplet ejection heads to eliminate an ejection failure, wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads to eliminate the ejection failure on the basis of the vibration pattern of the residual vibration of the diaphragm and/or the information obtained from the vibration pattern which are stored in the storage means as taught by Usui into Usui et al. as modified by Fujii for the purposes of determining if any print head maintenance is necessary; and maintaining a quality print image.

13. Claims 9, 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al. (US 2002/0039120) and Takahashi et al. (US 5,475,404) as applied to claim 7 above, and further in view of Usui (US 6,820,955).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al. and Takahashi et al. disclose all the claimed limitations except for the following:**

\*regarding claim 9, time measuring means for measuring a time period from the time when the cutoff of the main power supply is detected by the power cutoff detecting means to the time when the main power supply is switched on

\*regarding claims 11 and 13, recovery means for carrying out recovery processing for the droplet ejection heads to eliminate an ejection failure

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads to eliminate the ejection failure on the basis of the vibration pattern of the residual vibration of the diaphragm and/or the information obtained from the vibration pattern, and information indicating whether or not the droplet ejection heads are in the protection state, which are stored in the storage means

**Usui disclose the following:**

\*regarding claim 9, time measuring means for measuring a time period from the time when the cutoff of the main power supply is detected by the power cutoff detecting means to the time when the main power supply is switched on (fig. 10; col. 22, lines 38-59) for the purpose of determining if any print head maintenance is necessary

\*regarding claims 11 and 13, recovery means for carrying out recovery processing for the droplet ejection heads to eliminate an ejection failure (figs. 5 and 10; col. 22, line 60- col. 23, line 53; obtains temperature information and with respect to downtime adjust driving signal – prepares for printing commands) for the purpose of maintaining a quality print image

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads to eliminate the ejection failure on the basis of the vibration pattern of the residual vibration of the diaphragm and/or the information obtained from the vibration pattern, and information indicating whether or not the droplet ejection heads are in the protection state, which are stored in the storage means for the purpose of maintaining a quality print image

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a time measuring means for measuring a time period from the time when the cutoff of the main power supply is detected by the power cutoff detecting means to the time when the main power supply is switched on; and recovery means for carrying out recovery processing for the droplet ejection heads to eliminate an ejection failure, wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads to eliminate the ejection failure on the basis of the vibration pattern of the residual vibration of the diaphragm and/or the information obtained from the vibration pattern, and information indicating whether or not the droplet ejection heads are in the protection state, which are stored in the storage means as taught by Usui into Usui et al. as modified by Fujii, Kawamura, Otsuka et al. and Takahashi et al. for the purposes of determining if any print head maintenance is necessary; and maintaining a quality print image.

14. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) and Usui (US 6,820,955) as applied to claim 10 above, and further in view of Yamaguchi et al. (US 5,379,061)

**Usui et al. as modified by Fujii and Usui disclose the following claimed limitations:**

\*regarding claim 17, recovery means carries out the flushing process or the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is thickening of the liquid in the vicinity of the nozzle due to drying (Fujii; col. 8, line 20-50 & col. 2, lines 5-27)

**Usui et al. as modified by Fujii and Usui does not disclose the following:**

\*regarding claim 14, recovery means includes: wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper; flushing means for carrying out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator; and pumping means for carrying out a pump-suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads

\*regarding claim 15, recovery means carries out the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity

\*regarding claim 16, recovery means carries out at least the wiping process in the case where a cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle

**Yamaguchi et al. disclose the following:**

\*regarding claim 14, recovery means includes: wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper (col. 25, line 44 – col. 26, line 5); flushing means for carrying out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator (col. 5, line 19 – col. 6, line 7); and pumping means for carrying out a pump-suction process with the use of a pump connected to a cap that covers the

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nozzle surface of the droplet ejection heads (col. 5, line 19 – col. 6, line 7) for the purpose of removing any air bubbles or debris that may adversely affect print quality

\*regarding claim 15, recovery means carries out the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity (col. 6, lines 26-33) for the purpose of removing air in the system to maintaining proper functioning of nozzles

\*regarding claim 16, recovery means carries out at least the wiping process in the case where a cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle (col. 25, line 44 – col. 26, line 5) for the purpose of removing any debris that may adversely affect print quality

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a recovery means including: wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper; flushing means for carrying out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator; and pumping means for carrying out a pump-suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads; recovery means carries out the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity; and recovery means carries out at least the wiping process in the case where a cause of the ejection failure of the droplet ejection

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heads is adhesion of paper dust in the vicinity of an outlet of the nozzle as taught by Yamaguchi et al. into Usui et al. as modified by Fujii and Usui for the purposes of removing any air bubbles or debris that may adversely affect print quality; removing air in the system to maintaining proper functioning of nozzles; and removing any debris that may adversely affect print quality.

15. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Takazawa et al. (US 2002/0018090).

**Usui et al. as modified by Fujii disclose the following claimed limitations:**

\*regarding claim 20, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration (Usui et al. paragraph 0284 – “resonant frequency”)

**Usui et al. as modified by Fujii does not disclose the following:**

\* regarding claim 19, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

**Takazawa et al. disclose the following:**

\*regarding claim 19, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof (paragraphs 0004, 0005, 0011, 0101, and 0122) for the purpose of maintaining print quality

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof, wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern as taught by Takazawa et al. into Usui et al. as modified by Fujii for the purpose of maintaining print quality.

16. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) and Takazawa et al. (US 2002/0018090) as applied to claim 20 above, and further in view of Shinkawa (US 2005/0128232).

The applied reference has a common applicant with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter

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disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

**Usui et al. as modified by Fujii and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 21, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold

**Shinkawa et al. disclose the following:**

\*regarding claim 21, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle (paragraph 0109-0111); the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold (paragraph 0112-0113); and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual

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vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold (paragraph 0114-0116) (paragraph 0106-0108) for the purpose of determining the cause of ejection failure

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold as taught by Shinkawa into Usui et al. as modified by Fujii and Takazawa for the purposes of determining the cause of ejection failure.

17. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) and Takazawa et al. (US 2002/0018090) as applied to claim 19 above, and further in view of Usui (US 6,820,955).

**Usui et al. as modified by Fujii and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 22, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the

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recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means

**Usui disclose the following:**

\*regarding claim 22, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure (figs. 5 and 10; col. 22, line 60- col. 23, line 53; obtains temperature information and with respect to downtime adjust driving signal – prepares for printing commands) for the purpose of maintaining a quality print image

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means for the purpose of maintaining a quality print image

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure, wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means as taught by Usui into Usui et al. as modified by Fujii and Takazawa et al. for the

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purposes of determining if any print head maintenance is necessary; and maintaining a quality print image.

18. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al. (US 2002/0039120) and Takahashi et al. (US 5,475,404) as applied to claim 7 above, and further in view of Takazawa et al. (US 2002/0018090).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al. and Takahashi et al. disclose the following claimed limitations:**

\*regarding claim 24, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration (Usui et al. paragraph 0284 – “resonant frequency”)

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al. and Takahashi et al. does not disclose all the following claimed limitations:**

\* regarding claim 23, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

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**Takazawa et al. disclose the following:**

\*regarding claim 23, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof (paragraphs 0004, 0005, 0011, 0101, and 0122) for the purpose of maintaining print quality

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof, wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern as taught by Takazawa et al. into Usui et al. as modified by Fujii, Kawamura, Otsuka et al. and Takahashi et al. for the purpose of maintaining print quality.

19. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al. (US 2002/0039120), Takahashi et al. (US 5,475,404) and Takazawa et al. (US 2002/0018090) as applied to claim 24 above, and further in view of Shinkawa (US 2005/0128232).

The applied reference has a common applicant with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 25, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold

**Shinkawa et al. disclose the following:**

\*regarding claim 25, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle (paragraph 0109-0111); the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold (paragraph 0112-0113); and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold (paragraph 0114-0116) (paragraph 0106-0108) for the purpose of determining the cause of ejection failure

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold as taught by Shinkawa into Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Takazawa et al. for the purposes of determining the cause of ejection failure.

20. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al.

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(US 2002/0039120), Takahashi et al. (US 5,475,404) and Takazawa et al. (US 2002/0018090) as applied to claim 23 above, and further in view of Usui (US 6,820,955).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 26, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means

**Usui disclose the following:**

\*regarding claim 26, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure (figs. 5 and 10; col. 22, line 60- col. 23, line 53; obtains temperature information and with respect to downtime adjust driving signal – prepares for printing commands) for the purpose of maintaining a quality print image

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means for the purpose of maintaining a quality print image

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure, wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means as taught by Usui into Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Takazawa et al. for the purposes of determining if any print head maintenance is necessary; and maintaining a quality print image.

21. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) and Usui (US 6,820,955) as applied to claim 8 above, and further in view of Takazawa et al. (US 2002/0018090).

**Usui et al. as modified by Fujii and Usui disclose all the following claimed limitations:**

\*regarding claim 28, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration (Usui et al. paragraph 0284 – “resonant frequency”)

**Usui et al. as modified by Fujii and Usui does not disclose all the following claimed limitations:**

\* regarding claim 27, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet

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ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

**Takazawa et al. disclose the following:**

\*regarding claim 27, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof (paragraphs 0004, 0005, 0011, 0101, and 0122) for the purpose of maintaining print quality

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof, wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern as taught by Takazawa et al. into Usui et al. as modified by Fujii and Usui for the purpose of maintaining print quality.

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22. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Usui (US 6,820,955) and Takazawa et al. (US 2002/0018090) as applied to claim 28 above, and further in view of Shinkawa (US 2005/0128232).

The applied reference has a common applicant with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

**Usui et al. as modified by Fujii, Usui and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 29, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened

due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold

**Shinkawa et al. disclose the following:**

\*regarding claim 29, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle (paragraph 0109-0111); the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold (paragraph 0112-0113); and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold (paragraph 0114-0116) (paragraph 0106-0108) for the purpose of determining the cause of ejection failure

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold as taught by

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Shinkawa into Usui et al. as modified by Fujii, Usui and Takazawa et al. for the purposes of determining the cause of ejection failure.

23. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Usui (US 6,820,955) and Takazawa et al. (US 2002/0018090) as applied to claim 27 above, and further in view of Usui (US 6,820,955).

**Usui et al. as modified by Fujii, Usui and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 30, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means

**Usui disclose the following:**

\*regarding claim 30, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure (figs. 5 and 10; col. 22, line 60- col. 23, line 53; obtains temperature information and with respect to downtime adjust driving signal – prepares for printing commands) for the purpose of maintaining a quality print image

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the

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recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means for the purpose of maintaining a quality print image

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure, wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means as taught by Usui into Usui et al. as modified by Fujii, Usui and Takazawa et al. for the purposes of determining if any print head maintenance is necessary; and maintaining a quality print image.

24. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al. (US 2002/0039120), Takahashi et al. (US 5,475,404) and Usui (US 6,820,955) as applied to claim 9 above, and further in view of Takazawa et al. (US 2002/0018090).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Usui disclose the following claimed limitations:**

\*regarding claim 32, vibration pattern of the residual vibration of the diaphragm includes a cycle of the residual vibration (Usui et al. paragraph 0284 – “resonant frequency”)

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Usui does not disclose the following claimed limitations:**

\* regarding claim 31, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

**Takazawa et al. disclose the following:**

\*regarding claim 31, ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof (paragraphs 0004, 0005, 0011, 0101, and 0122) for the purpose of maintaining print quality

\*wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means for detecting an ejection failure of the droplet ejection heads and a cause thereof, wherein, when the cutoff of the main power supply is detected by the power cutoff detecting means, the ejection failure detecting

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means detects an ejection failure of the droplet ejection heads and the cause thereof on the basis of the vibration pattern of the residual vibration of the diaphragm, and the storage means stores the detection result as the information obtained from the vibration pattern as taught by Takazawa et al. into Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al. and Usui for the purpose of maintaining print quality.

25. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al. (US 2002/0039120), Takahashi et al. (US 5,475,404), Usui (US 6,820,955) and Takazawa et al. (US 2002/0018090) as applied to claim 32 above, and further in view of Shinkawa (US 2005/0128232).

The applied reference has a common applicant with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the

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reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al., Usui and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 33, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold

**Shinkawa et al. disclose the following:**

\*regarding claim 33, ejection failure detecting means judges that: an air bubble has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle (paragraph 0109-0111); the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold (paragraph 0112-0113); and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold (paragraph 0114-0116) (paragraph 0106-0108) for the purpose of determining the cause of ejection failure

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means judges that: an air bubble

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has intruded into the cavity in the case where the cycle of the residual vibration of the diaphragm is shorter than a predetermined range of cycle; the liquid in the vicinity of the nozzle has thickened due to drying in the case where the cycle of the residual vibration of the diaphragm is longer than a predetermined threshold; and paper dust is adhering in the vicinity of the outlet of the nozzle in the case where the cycle of the residual vibration of the diaphragm is longer than the predetermined range of cycle and shorter than the predetermined threshold as taught by Shinkawa into Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al., Usui and Takazawa et al. for the purposes of determining the cause of ejection failure.

26. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277), Kawamura (US 4,577,203), Otsuka et al. (US 2002/0039120), Takahashi et al. (US 5,475,404), Usui (US 6,820,955) and Takazawa et al. (US 2002/0018090) as applied to claim 31 above, and further in view of Usui (US 6,820,955).

**Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al., Usui and Takazawa et al. disclose all the claimed limitations except for the following:**

\*regarding claim 34, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means

**Usui disclose the following:**

\*regarding claim 34, recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure (figs. 5 and 10; col. 22, line 60- col. 23, line 53; obtains temperature information and with respect to downtime adjust driving signal – prepares for printing commands) for the purpose of maintaining a quality print image

\*wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means for the purpose of maintaining a quality print image

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a recovery means for carrying out recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate an ejection failure, wherein, when the main power supply is switched on after the cutoff of the main power supply has been detected by the power cutoff detecting means, the recovery means carries out the recovery processing for the droplet ejection heads in accordance with the cause of the ejection failure to eliminate the cause of the ejection failure by using the detection result stored in the storage means as taught by Usui into Usui et al. as modified by Fujii, Kawamura, Otsuka et al., Takahashi et al., Usui and Takazawa et al. for the purposes of determining if any print head maintenance is necessary; and maintaining a quality print image.

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27. Claims 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) and Takazawa et al. (US 2002/0018090) as applied to claim 19 above, and further in view of Yamaguchi et al. (US 5,379,061)

**Usui et al. as modified by Fujii and Takazawa et al. disclose the following claimed limitations:**

\*regarding claim 38, recovery means carries out the flushing process or the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is thickening of the liquid in the vicinity of the nozzle due to drying (Fujii; col. 8, line 20-50 & col. 2, lines 5-27)

**Usui et al. as modified by Fujii and Takazawa et al. does not disclose the following:**

\*regarding claim 35, recovery means includes: wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper; flushing means for carrying out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator; and pumping means for carrying out a pump-suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads

\*regarding claim 36, recovery means carries out the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity

\*regarding claim 37, recovery means carries out at least the wiping process in the case where a cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle

**Yamaguchi et al. disclose the following:**

\*regarding claim 35, recovery means includes: wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper (col. 25, line 44 – col. 26, line 5); flushing means for carrying out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator (col. 5, line 19 – col. 6, line 7); and pumping means for carrying out a pump-suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads (col. 5, line 19 – col. 6, line 7) for the purpose of removing any air bubbles or debris that may adversely affect print quality

\*regarding claim 36, recovery means carries out the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity (col. 6, lines 26-33) for the purpose of removing air in the system to maintaining proper functioning of nozzles

\*regarding claim 37, recovery means carries out at least the wiping process in the case where a cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle (col. 25, line 44 – col. 26, line 5) for the purpose of removing any debris that may adversely affect print quality

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a recovery means including: wiping means for carrying out a wiping process in which a nozzle surface of the droplet ejection heads where the nozzles are arranged is wiped with a wiper; flushing means for carrying out a flushing process by which the droplets are preliminarily ejected through the nozzles of the droplet ejection heads by driving the actuator; and pumping means for carrying out a pump-suction process with the use of a pump connected to a cap that covers the nozzle surface of the droplet ejection heads; recovery means carries out the pump-suction process in the case where a cause of the ejection failure of the droplet ejection heads is intrusion of an air bubble into the cavity; and recovery means carries out at least the wiping process in the case where a cause of the ejection failure of the droplet ejection heads is adhesion of paper dust in the vicinity of an outlet of the nozzle as taught by Yamaguchi et al. into Usui et al. as modified by Fujii and Takazawa et al. for the purposes of removing any air bubbles or debris that may adversely affect print quality; removing air in the system to maintaining proper functioning of nozzles; and removing any debris that may adversely affect print quality.

28. Claims 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Shinkawa (US 2005/0128232).

The applied reference has a common applicant with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the

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inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

**Usui et al. as modified by Fujii disclose all the claimed limitations except for the following:**

\*regarding claim 39, ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component that varies with the residual vibration of the diaphragm

\*regarding claim 40, ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm

\*regarding claim 41, ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element

\*regarding claim 42, ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit

**Shinkawa et al. disclose the following:**

\*regarding claim 39, ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component that varies with the residual vibration of the diaphragm (paragraphs 0117-0118) for the purpose of detecting ejection failure

\*regarding claim 40, ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm (paragraph 0117-0118) for the purpose of detecting ejection failure

\*regarding claim 41, ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element (paragraph 0118) for the purpose of detecting ejection failure

\*regarding claim 42, ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a

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predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit (paragraph 0126)

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component that varies with the residual vibration of the diaphragm; ejection failure detecting means includes an oscillation circuit and the oscillation circuit oscillates in response to an electric capacitance component of the actuator that varies with the residual vibration of the diaphragm; ejection failure detecting means includes a resistor element connected to the actuator, and the oscillation circuit forms a CR oscillation circuit based on the electric capacitance component of the actuator and a resistance component of the resistor element; and an ejection failure detecting means includes an F/V converting circuit that generates a voltage waveform in response to the residual vibration of the diaphragm from a predetermined group of signals generated based on changes in an oscillation frequency of an output signal from the oscillation circuit as taught by Shinkawa into Usui et al. as modified by Fujii for the purposes of detecting ejection failure.

29. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Sakai et al. (US 6,234,607).

**Usui et al. as modified by Fujii disclose all the claimed limitations except for the following:**

\* regarding claim 47, actuator includes an electrostatic actuator

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**Sakai et al. disclose the following:**

\*regarding claim 47, actuator includes an electrostatic actuator/111/ (paragraph 0190) for the purpose of vibrating ink to the point that the ink is not discharged form the corresponding nozzle

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an actuator including an electrostatic actuator as taught by Sakai et al. into Usui et al. as modified by Fujii for the purpose of vibrating ink to the point that the ink is not discharged form the corresponding nozzle.

30. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Izumida et al. (US 5,371,528).

**Usui et al. as modified by Fujii disclose all the claimed limitations except for the following:**

\* regarding claim 49, actuator includes a film boiling actuator provided with a heating element that generates heat by conducting an electric current thereto

**Izumida et al. disclose the following:**

\*regarding claim 49, actuator/**electrothermal transducers**/ includes a film boiling actuator provided with a heating element that generates heat by conducting an electric current/**electric signals**/ thereto (col. 9, line 65 – col. 10, line14) for the purpose of producing a bubble to eject ink from nozzle

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize an actuator including a film boiling actuator provided with a heating element that generates heat by conducting an electric current thereto as taught by

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Izumida et al. into Usui et al. as modified by Fujii for the purpose of producing a bubble to eject ink from nozzle.

31. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over Usui et al. (US 2002/0107353) as modified by Fujii (US 6,299,277) as applied to claim 1 above, and further in view of Hiyoshi (US 2005/0017601).

**Usui et al. as modified by Fujii disclose all the claimed limitations except for the following:**

\* regarding claim 50, diaphragm deforms elastically so as to follow a change in the internal pressure of the cavity

**Hiyoshi disclose the following:**

\*regarding claim 50, diaphragm deforms elastically so as to follow a change in the internal pressure of the cavity (paragraph 0003) for the purpose of creating a vibration within cavity and thereby ejecting ink droplets

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize a diaphragm deforms elastically so as to follow a change in the internal pressure of the cavity as taught by Hiyoshi into Usui et al. as modified by Fujii for the purpose of creating a vibration within cavity and thereby ejecting ink droplets.

***Allowable Subject Matter***

32. Claims 43-46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:  
The primary reason for the allowance of claims 43-46 is the inclusion of the limitations being for

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a droplet ejection apparatus including an ejection failure detecting means includes a waveform shaping circuit that shapes the voltage waveform in response to the residual vibration of the diaphragm generated by the F/V converting circuit into a predetermined waveform. It is these limitations found in the claims, as they are claimed in the combination, that has not been found, taught or suggested by the prior art of record which makes these claims allowable over the prior art.

### ***Conclusion***

33. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tokumaru et al. (US 6,257,694) includes air bubble detection, switch between an ejection detection mode and operating mode, and suction to clear out debris and air bubbles.

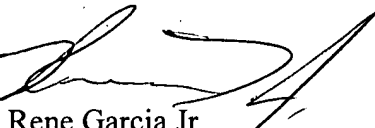
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***Communications with the USPTO***

34. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rene Garcia, Jr. whose telephone number is (571) 272-5980. The examiner can normally be reached on M-F 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Rene Garcia Jr  
31 January 2006

  
K. JEGGINS  
PRIMARY EXAMINER